This manual covers the following B&B Electronics' model serial cards:

Four Port, Any Address, Any IRQ RS-232/422/485 Serial Card CE

Model 3PXCC4A

Documentation Number 3PXCC4A3001

Each of these models is an RS-232 serial card and uses the same printed circuit board. The "1" and "2" suffix designates the number of ports on the card. The model number of the card is printed on a sticker on the board.

This product designed and manufactured in Ottawa, Illinois USA of domestic and imported parts by

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Chapter 1: Introduction and General Information

The B&B Electronics' 3PXCC4A series serial interface cards are designed for the IBM PC, XT, AT and compatibles. Ports are configured as a standard DTE device, and connections are made on RJ45 style connectors.

The 3PXCC4A cards offer exceptional setup flexibility. The 3PXCC4A series has the ability to use any I/O address and any hardware interrupt. You can install as many serial ports as will physically fit in a machine. To use one of the "non-standard" addresses or interrupts, the serial software used must also offer that flexibility. If you are writing your own application, be sure the communications routines used support any address and IRQ. B&B Electronics' SimpCom Communications Drivers support these features.

Features

Each port independently configurable for any hex address 0 to hex 3F8 including COM1 – COM4

Each port independently configurable for any interrupt: 2, 3, 4, 5, 6, 7, 10, 11, 12, 14, and 15

Shared IRQ capability with Interrpt Status Register

Each port independently configurable for RS-232/RS-422 or RS-485

Jumper selectable interrupts: 2, 3, 4, 5, 6, 7, 10, 11, 12, 14, and 15

Enhanced 16 bit Address Decoding

Baud rates up to 460.8K baud in RS-422/RS-485 Mode, 115.2K baud in RS-232 Mode

16550A UARTs on all ports

RS-232 mode supports lines: TD, RD, RTS, CTS, DSR, DCD, and DTR

RS-422/RS-485 mode supports lines: TD and RD

RTS control of RS-485 driver enable

Can be wired for half or full duplex RS-485 communications

Specifications

Bus: IBM PC ISA Bus

Slot: Requires 1 full length slot for complete IRQ selectability. When installed in a short slot, IRQ's 10-15 will not be available.

Dimensions: 7.1 x 4.3 in (18 x 10.9cm)

I/O connection: RJ45 (8 conductor) connectors for all four ports

Character length: 5, 6, 7, or 8 bits

Parity: Even, odd or none

Stop bits: 1, 1.5, or 2

RS-232 Drivers:
Device: 75185 Transceiver
High level output voltage: 6.0 V minimum
Low level output voltage: -6.0 V minimum

Output current limited to ±10 mA

RS-232 Receivers:
Device: 75185 Transceiver
Input high threshold voltage: 1.5V
Input low threshold voltage: 0.75V
Device will withstand ±30V

RS-422/485 Driver/Receiver:
Device: 75ALS180
Differential driver output voltage: 1.5 - 6 V
Differential input high-threshold voltage: 0.2 V
Differential input low-threshold voltage: -0.2 V

Power Consumption:
RS-422/485 Mode without termination on drivers
+5V, 175mA, 875mW
+12V, 60mA, 720mW
-12V, 60mA, 720mW
RS-232 Mode
+5V, 165mA, 825mW
+12V, 80mA, 960mW
-12V, 80mA, 960mW

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Chapter 2: Quick Installation Guide

The following steps will help you install the Model 3PXCC4A Serial Card. Please follow (step-by-step) the following numbered instructions and refer to any corresponding chapters for more details.

> **CAUTION: Electrostatic Sensitive Device.**
> **Use ESD precautions for safe handling.**

Before removing the card from the anti-static protective packaging.

- Discharge any static electricity buildup on your body by touching a large grounded metal surface or the metal chassis on equipment connected to earth ground by a 3-wire power cord.

- Avoid touching the gold connectors or other parts on the card except as necessary. After setting the jumper, ground yourself to the computer chassis before and while inserting the card.

- Remove AC power from the computer and unplug the power cord before inserting the card.

- Retain the ESD bag for handling the card.

  Save the packaging for storage or shipping.

1. Make sure you have an available ISA slot for installing your B&B Electronics Serial Card. You may have to remove the cover of your PC.

2. Determine what addresses and IRQ's are free to use on your PC by checking your operating system for unused addresses and IRQ's. Each port uses eight I/O address spaces starting at the base address that you select. Each port I/O address and interrupt request (IRQ) must be set as well. See "Checking Device Manager for Available Address/IRQ's" in Chapter 3 for your operating system. Refer to Chapter 4 (Table 3) for frequently unused I/O addresses and IRQ's. Write down the address and IRQ you select to use. Do not physically install the ISA card at this point.

3. Add New Hardware – This consists of adding a port or ports to your operating system. See "Adding Serial Ports" in Chapter 3 for specific instructions for your operating system.

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4. Assign Address and IRQ – The address and IRQ are set in the operating system that you are using. This is the final step of adding new hardware. See Chapter 4 for more details.

5. Set up the address (with dipswitches) and IRQ (jumpers) on the serial card to reflect unused addresses and IRQ's that you want to use. The address dipswitch setting consists of configuring seven dipswitches that reflect a particular hex address. The IRQ is set via a little black jumper. See Chapter 4 for an explanation of address and IRQ settings as well as details on configuring the card itself.

6. Set serial card hardware jumpers for the communication parameters that you desire. See Chapter 5 for an explanation of serial parameters and details on how to configure them.

7. Shut down the PC before installing the serial card.

8. Install ISA serial card into an available ISA slot in the PC.

9. Physical Hook-up and Troubleshooting – pinout, cable data, and troubleshooting information. See Chapter 6 for more details.

Chapter 3: Windows Installation

Checking Device Manager for Available Address/IRQ's (Windows 95/98)

Click on Start / Settings / Control Panel and double-click on System Properties.

Left-click on Device Manager.
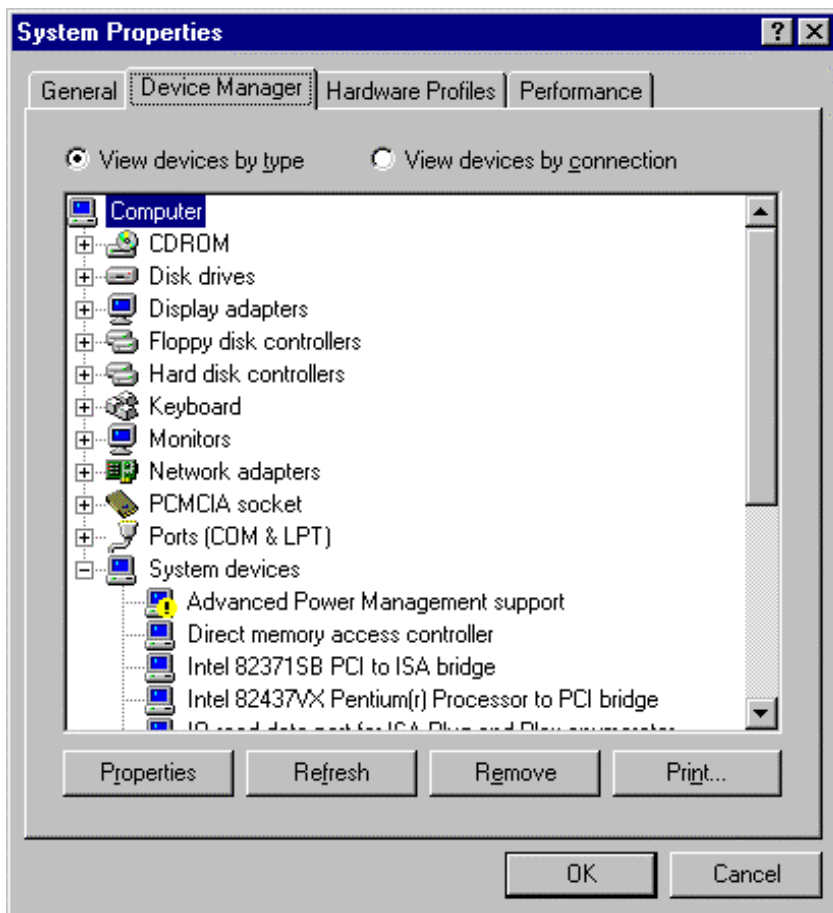
Double-click on Computer.

Computer Properties

View Resources | Reserve Resources

○ Interrupt request (IRQ)   ○ Direct memory access (DMA)
○ Input/output (I/O)   ○ Memory

Setting	Hardware using the setting
00	System timer
01	Standard 101/102-Key or Microsoft Natural Keyboard
02	Programmable interrupt controller
03	Communications Port (COM2)
04	Communications Port (COM1)
06	Standard Floppy Disk Controller
07	Printer Port (LPT1)
08	System CMOS/real time clock

OK   Cancel

Left-click on Interrupt Request.

Find a free IRQ in the displayed list. Any number that is seen on the left hand side of this screen is an IRQ that is currently being used. The object is to find a number of IRQ(s) that are **not** listed and set your port(s) using those IRQ's.

Left-click on Input/Output (I/O).
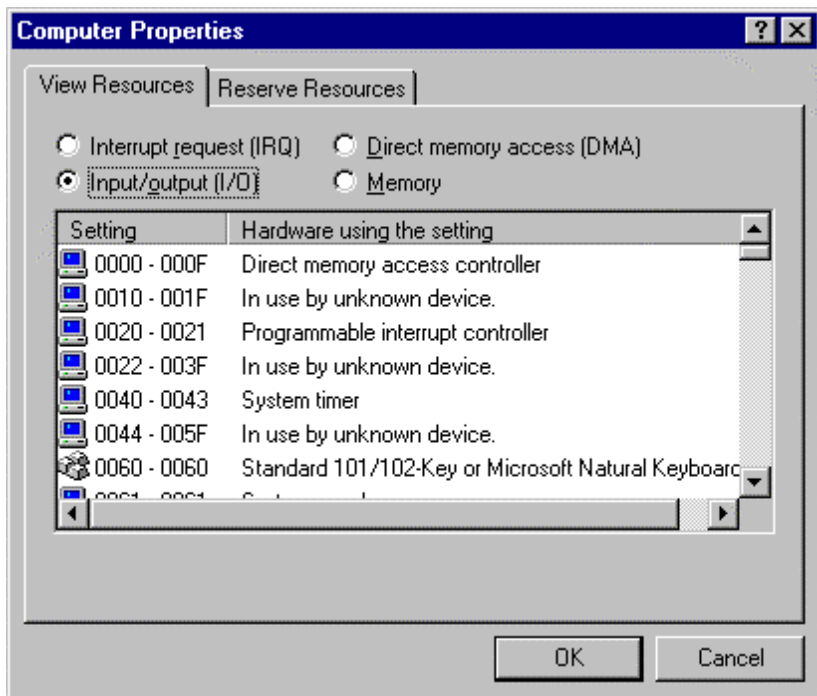
Computer Properties　　　　　　　　　　　　　　**? ✕**

View Resources | Reserve Resources

○ Interrupt request (IRQ)　　○ Direct memory access (DMA)
◉ Input/output (I/O)　　　　　○ Memory

Setting	Hardware using the setting
🖥 0000 - 000F	Direct memory access controller
🖥 0010 - 001F	In use by unknown device.
🖥 0020 - 0021	Programmable interrupt controller
🖥 0022 - 003F	In use by unknown device.
🖥 0040 - 0043	System timer
🖥 0044 - 005F	In use by unknown device.
🖧 0060 - 0060	Standard 101/102-Key or Microsoft Natural Keyboard
🖥 0061 - 0061	System speaker

　　　　　　　　　　　　　　　　　　　OK　　　**Cancel**

　　Scroll through the list, check 03F8H, 02F8H, 03E8H, 02E8H. If one of these is available, use it. If not, check alternates.

　　Find a free address in the list. Most desktop PC's have a COM1 and possibly a COM2 already on their system which will be seen in the list. You might have to start at COM3 or COM4 to begin addressing the ISA card. If these addresses are used you may have to resort to the Frequently Unused Port Addresses (found in Chapter 4, Table 3) of this manual. Write these open addresses and IRQ's down for later reference.

Adding Serial Port(s) in Windows 95/98

Go to Start Menu / Settings / Control Panel.

Run the Windows Add New Hardware utility found in the control panel. Click Next.

Click Next.
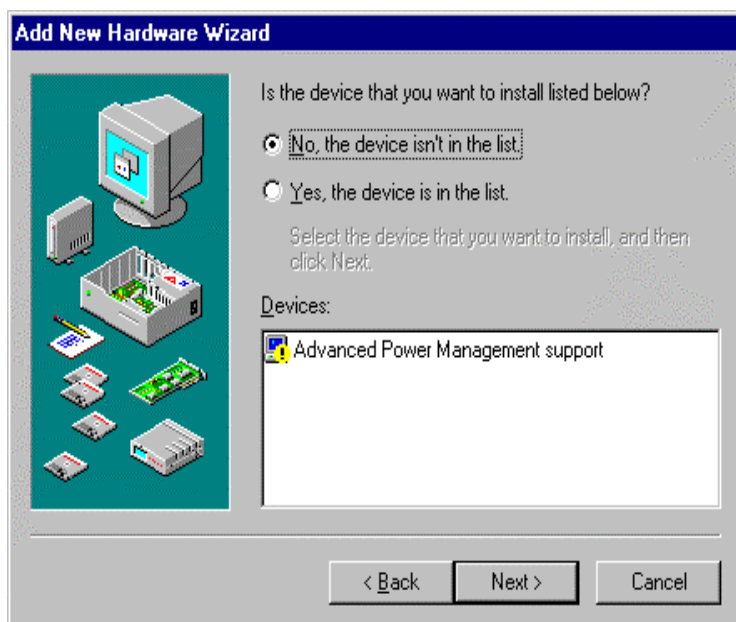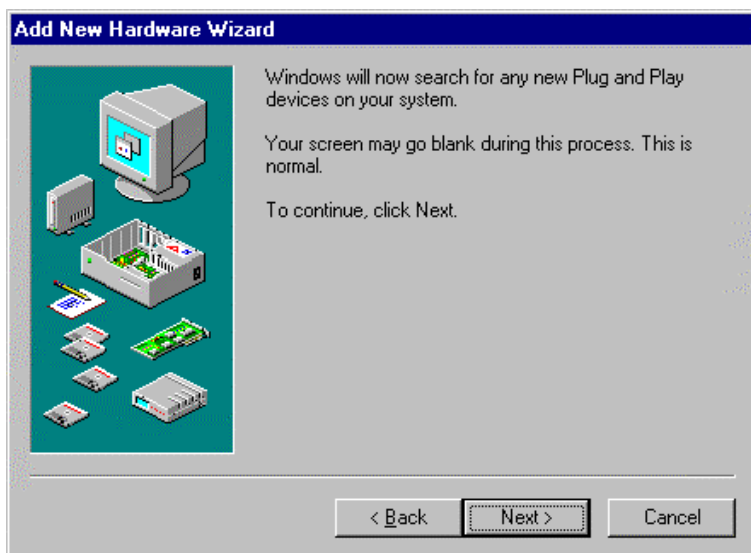
Select Yes/No for the device in the list. Click Next.

Add New Hardware Wizard

Windows can now search for hardware that is not Plug and Play compatible, or you can select your hardware from a list.

When Windows detects new hardware, it automatically determines the current settings for the device and installs the correct driver. For this reason it is strongly recommended that you have Windows search for your new hardware.

Do you want Windows to search for your new hardware?

○ Yes (Recommended)

⦿ No, I want to select the hardware from a list.

[< Back]   [Next >]   [Cancel]

Select No (you do not want Windows to search for your new hardware). Click Next.

Select Ports (COM & LPT). Click Next.

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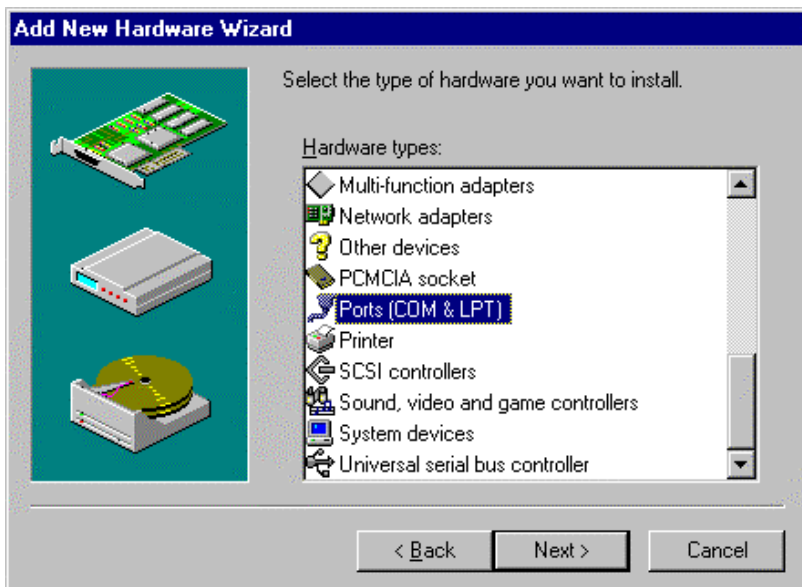
Select (Standard port types) and Communication Port. Click Next.

Add New Hardware Wizard

Because the device installation was canceled, Windows did not finish copying all the files that this hardware needs to work properly.

To finish installing the drivers for this hardware, click the Driver tab, and then click Update Driver.

< Back   Finish   Cancel
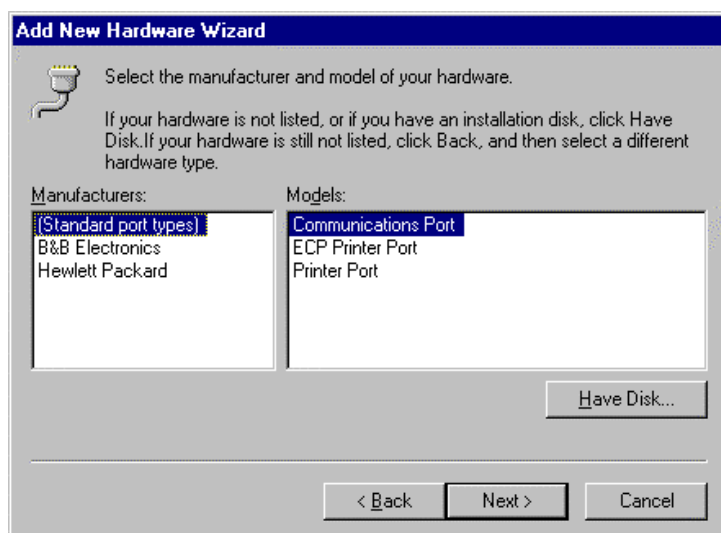
The next screen will show the address and interrupt request of the port. These may not match your configuration. For now, simply click Next. Windows may ask for the Windows 95/98 disk/CD to be inserted.

Finally, click Finish.

Changing COM Port Resources in Windows 95/98

Click Start / Settings / Control Panel and double-click on System Properties.
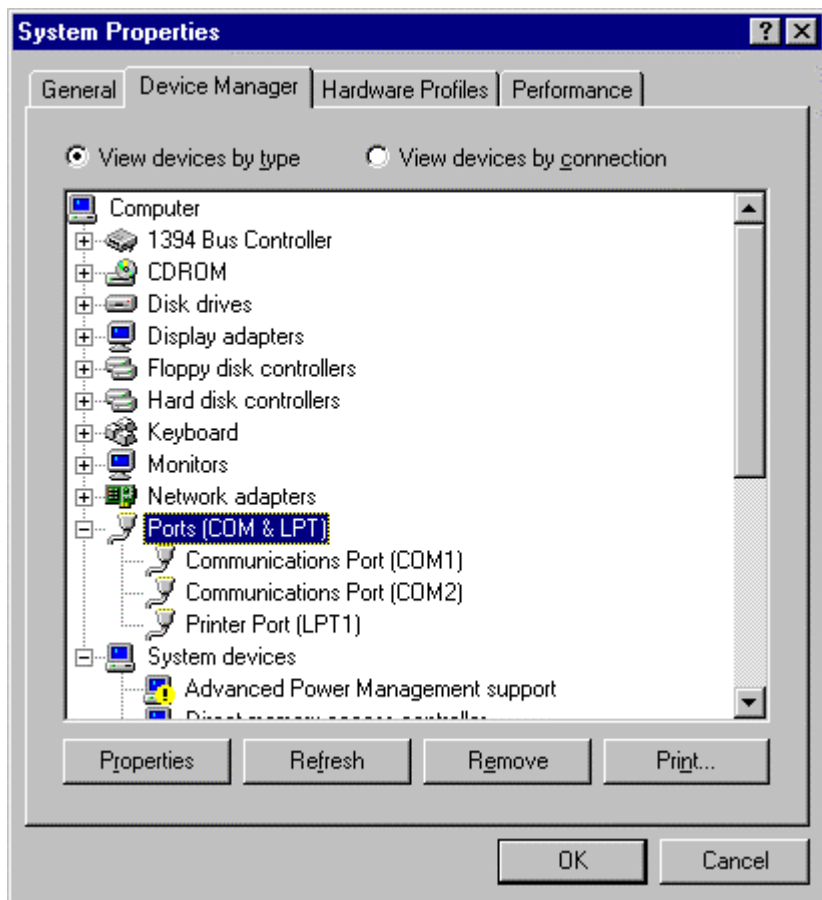
Click on Device Manager (make sure "View devices by type" is enabled.

Double-click on Ports (COM & LPT).

Double-click on the new port that has been added.

Communications Port (COM1) Properties   ? ✕

General | Port Settings | Driver | Resources |

Communications Port (COM1)

Device type: Ports (COM & LPT)
Manufacturer: (Standard port types)
Hardware version: Not available

Device status
This device is working properly.

Device usage
☐ Disable in this hardware profile

OK   Cancel
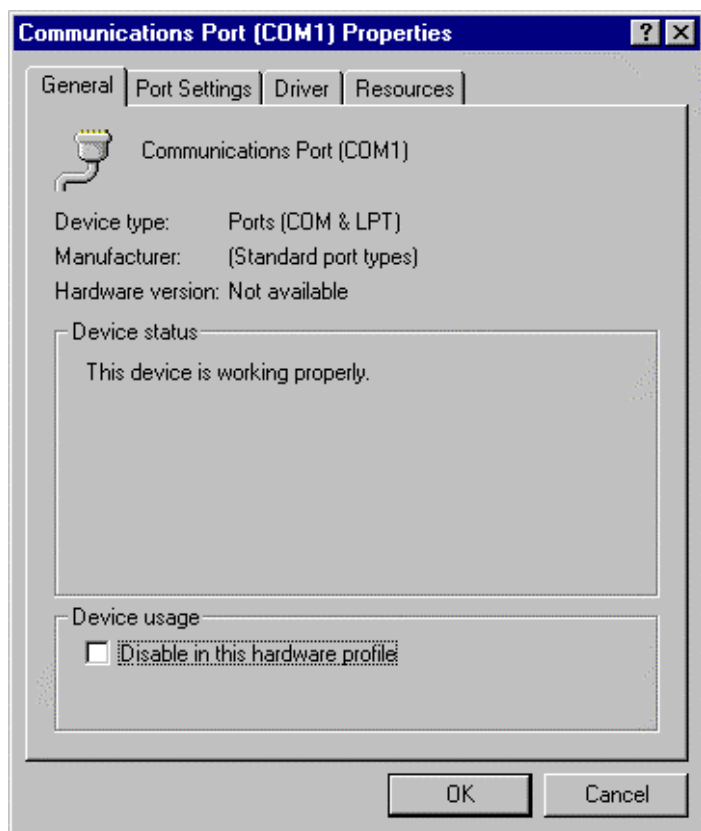
Click Resources.

Click off (check mark out of box) Use Automatic Settings.

Click off (check mark out of box) Use Automatic Settings.

Communications Port (COM1) Properties ? ✕

General | Port Settings | Driver | Resources |

Communications Port (COM1)

☐ Use automatic settings

Setting based on: Basic configuration 0003 ▼

Resource type	Setting
Input/Output Range	02E8 - 02EF
Interrupt Request	03

Change Setting...

Conflicting device list:

No conflicts.

OK | Cancel
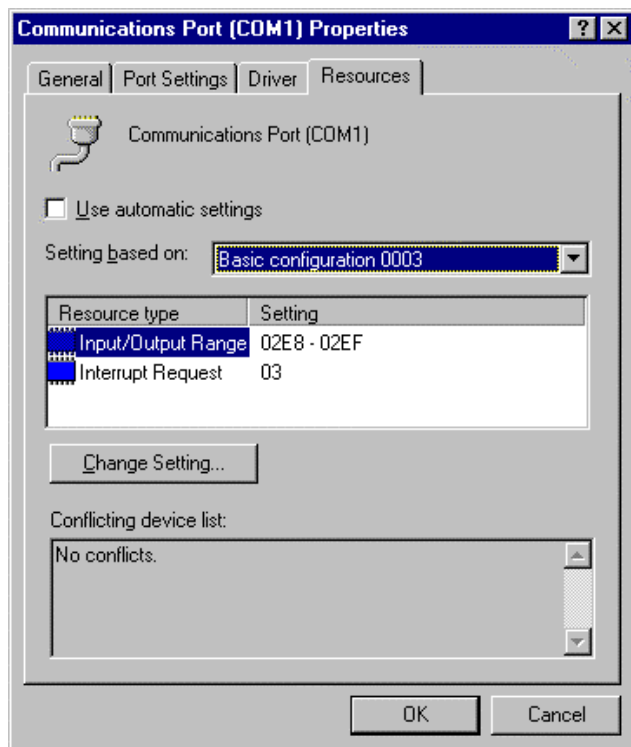
Select Basic Configuration 0007 (or last one).

Select Input / Output Range.

Click Change Setting.

Change Address to match the free address settings you found earlier.

Click OK.

Select Interrupt Request.

Click Change Settings.

Change IRQ to match the free IRQ settings you found earlier.

At this point you can shut down the system and physically install your B&B Electronics Serial Card into an available ISA slot. Double check to make sure the addresses and IRQ's on the Serial Card are set to the correct settings.

Checking Windows NT Diagnostics for Available Address/IRQ's (Windows NT 4.0)
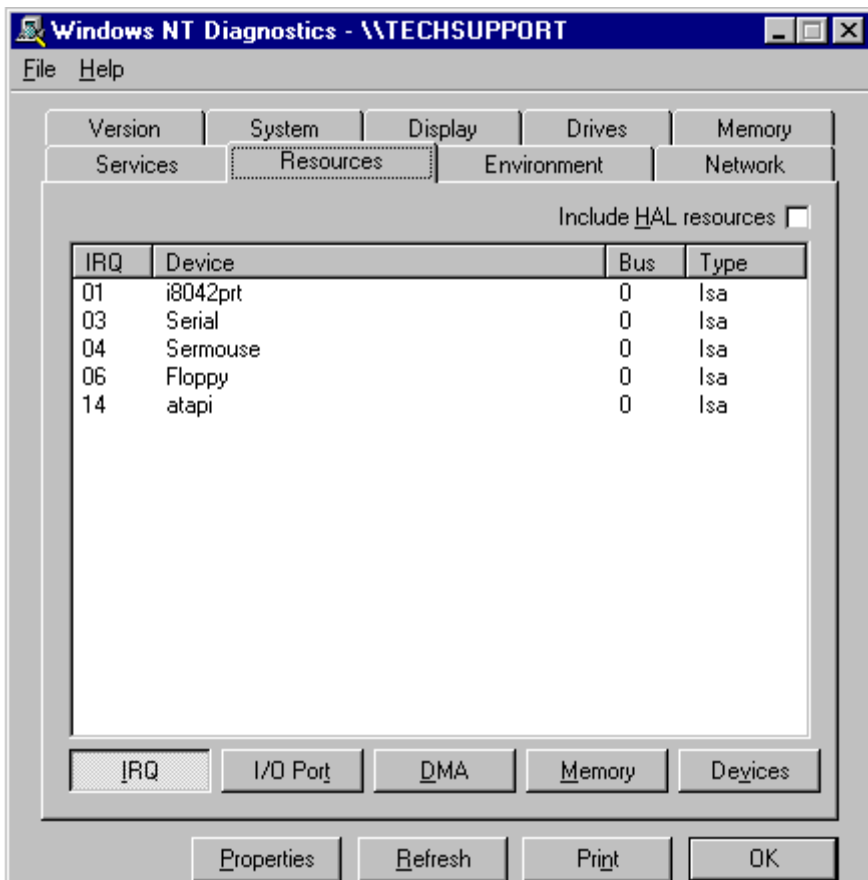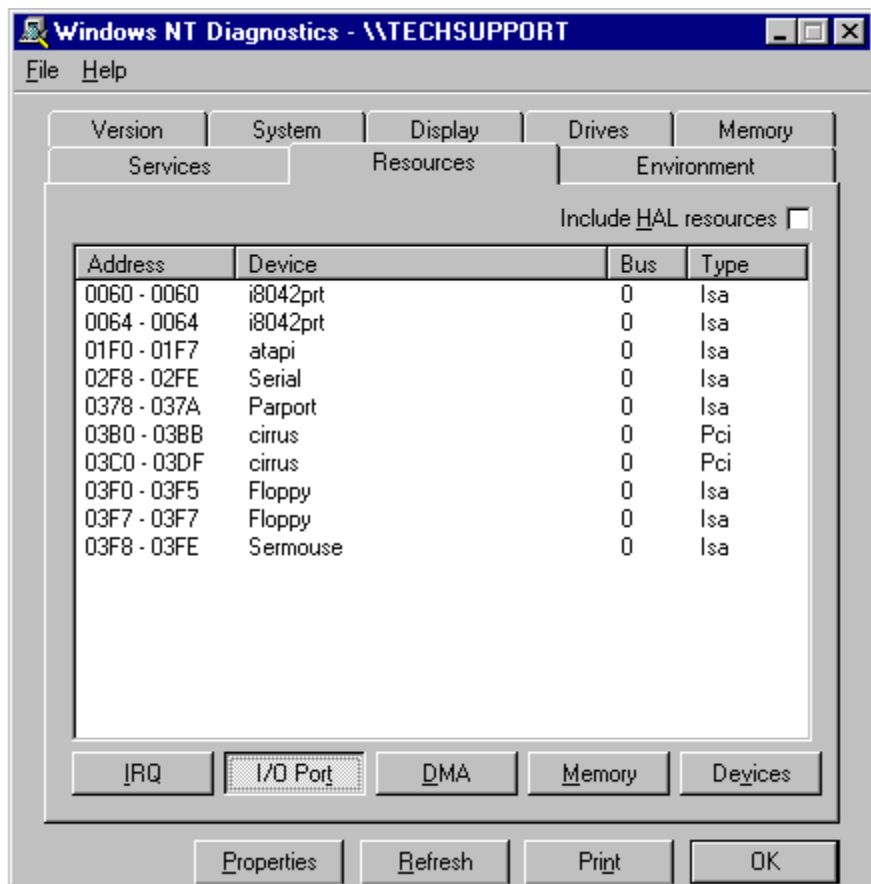
Click on Start / Programs / Administrative Tools / Windows NT Diagnostics.

Left-click on Resources.

```
Windows NT Diagnostics - \\TECHSUPPORT            _ □ ×
File  Help
┌─────────────────────────────────────────────────────────────────┐
│ Version  │  System  │  Display  │  Drives  │  Memory  │
│ Services │    Resources    │  Environment │  Network  │
│                                                                   │
│                              Include HAL resources ☐              │
│  ┌──────────────────────────────────────────────────────────┐    │
│  │ IRQ │ Device                          │ Bus │ Type │      │
│  │ 01  │ i8042prt                        │  0  │ Isa  │      │
│  │ 03  │ Serial                          │  0  │ Isa  │      │
│  │ 04  │ Sermouse                        │  0  │ Isa  │      │
│  │ 06  │ Floppy                          │  0  │ Isa  │      │
│  │ 14  │ atapi                           │  0  │ Isa  │      │
│  │                                                          │    │
│  └──────────────────────────────────────────────────────────┘    │
│  [  IRQ  ]  [ I/O Port ]  [  DMA  ]  [ Memory ]  [ Devices ]     │
│                                                                   │
│      [ Properties ]  [ Refresh ]  [ Print ]  [   OK   ]           │
└─────────────────────────────────────────────────────────────────┘
```

Find a free IRQ in the following list. Any number that is seen on the left hand side of this screen is an IRQ that is currently being used. The object is to find a number of IRQ(s) **not** listed and set your port(s) using those IRQ's.

Left-click on I/O Port in Resources. Tab to view currently used addresses.

Windows NT Diagnostics - \\TECHSUPPORT				_ □ ×
File	**Help**			

Version	System	Display	Drives	Memory
Services		Resources		Environment

Include <u>H</u>AL resources ☐

Address	Device	Bus	Type
0060 - 0060	i8042prt	0	Isa
0064 - 0064	i8042prt	0	Isa
01F0 - 01F7	atapi	0	Isa
02F8 - 02FE	Serial	0	Isa
0378 - 037A	Parport	0	Isa
03B0 - 03BB	cirrus	0	Pci
03C0 - 03DF	cirrus	0	Pci
03F0 - 03F5	Floppy	0	Isa
03F7 - 03F7	Floppy	0	Isa
03F8 - 03FE	Sermouse	0	Isa

<u>I</u>RQ	I/O Port	<u>D</u>MA	<u>M</u>emory	De<u>v</u>ices

| <u>P</u>roperties	<u>R</u>efresh	Pri<u>n</u>t	OK

Scroll through the list, check 03F8H, 02F8H, 03E8H, 02E8H. If one of these is available, use it. If not, check alternates.

Find a free address in the list. Most desktop PC's have a COM1 and possibly a COM2 already on their system, which will be seen in the list. You may have to start at COM3 or COM4 to start your addressing of the ISA card you have. If these addresses are used you may have to resort to the Frequently Unused Port Addresses (found in Chapter 4, Table 3) of this manual. Write these open addresses and IRQ's down for later reference.
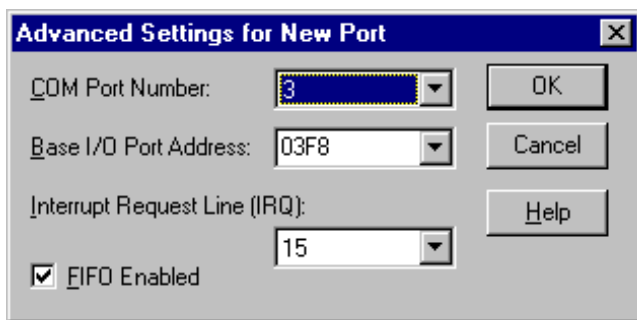
Adding Serial Port(s) in Windows NT 4.0

Go to Start Menu / Settings / Control Panel.

Double-click on Ports.
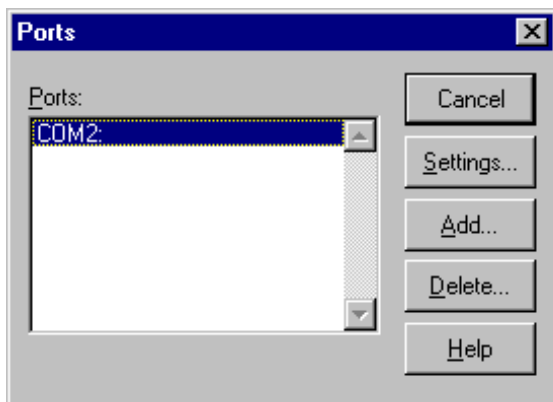
Click Add.

Choose COM Port Number, Base I/O Address, and IRQ that you want to use for the new Serial Port(s) being added.

After clicking OK, you will see a screen – System Setting Change. Click the button Restart Now to restart Windows NT 4.0.
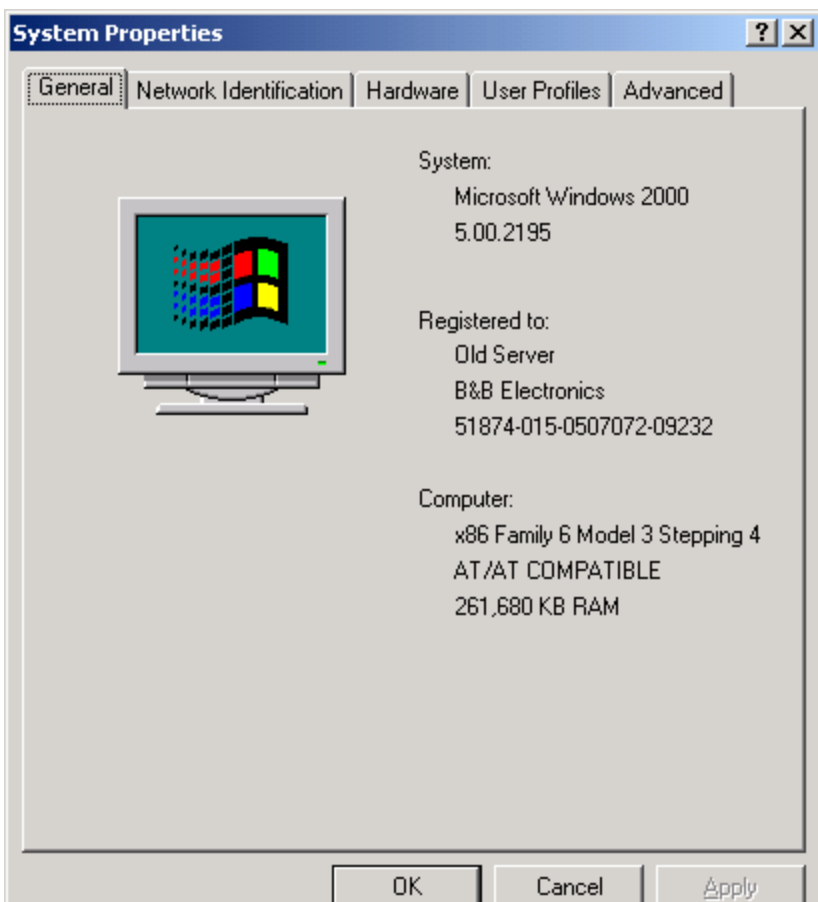
At this point you can shut down the system and physically install your B&B Electronics Serial Card into an available ISA slot. Double check to make sure the addresses and IRQ's on the Serial Card are set to the correct settings.
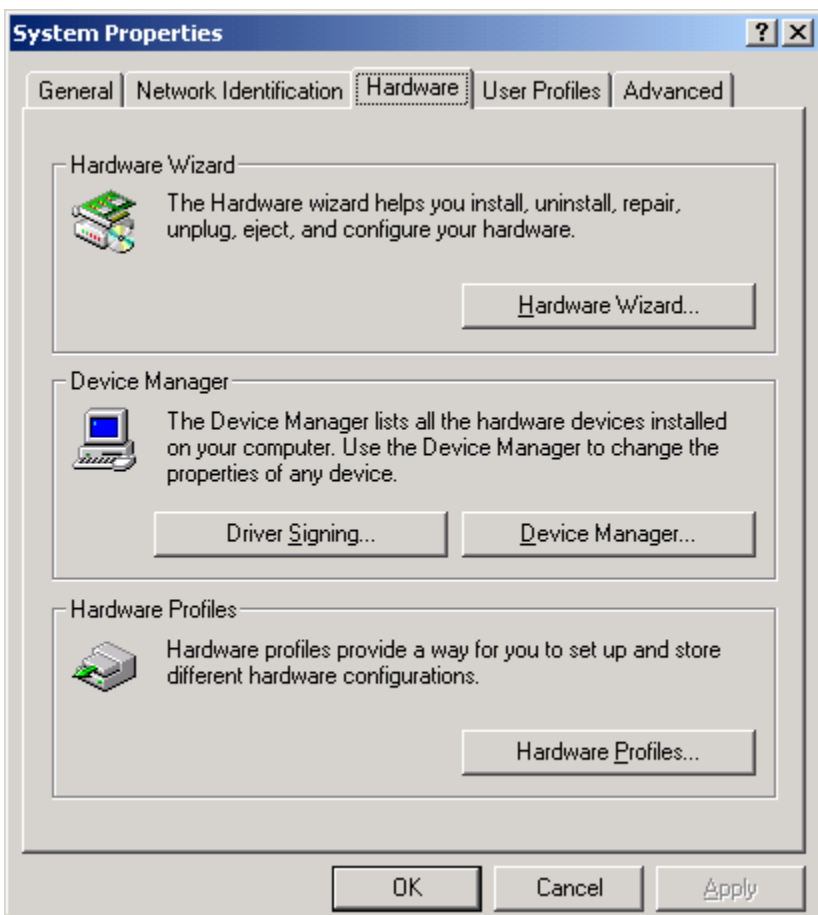
Checking Windows 2000 for Available Address/IRQ's
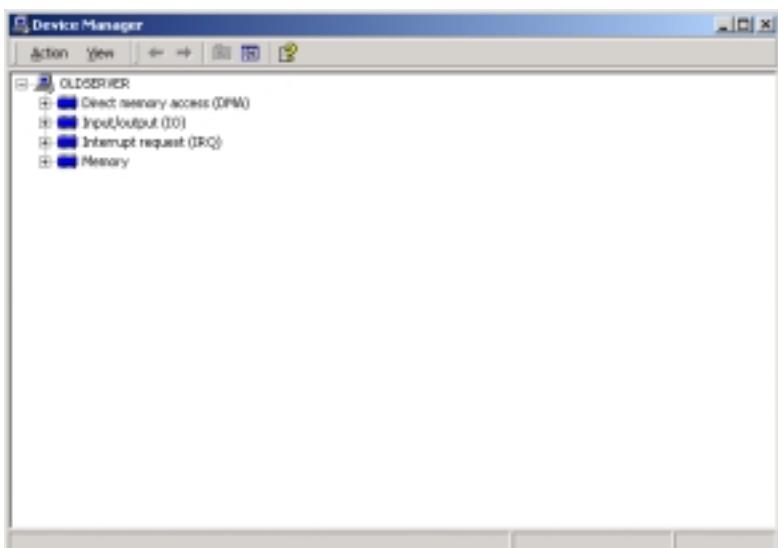
Click on Start / Settings / Control Panel.

Double-click on System.

Click on Hardware.

System Properties

General | Network Identification | Hardware | User Profiles | Advanced

Hardware Wizard

The Hardware wizard helps you install, uninstall, repair, unplug, eject, and configure your hardware.

Hardware Wizard...

Device Manager

The Device Manager lists all the hardware devices installed on your computer. Use the Device Manager to change the properties of any device.

Driver Signing... | Device Manager...

Hardware Profiles

Hardware profiles provide a way for you to set up and store different hardware configurations.

Hardware Profiles...

OK | Cancel | Apply

Click on Device Manager.

Click on View (top of screen).

Click on Resources by type.

Double-click on Input/Output. Find an unused address to set your
B&B Electronics serial card to.

Scroll through the list, check 03F8H, 02F8H, 03E8H, 02E8H. If
one of these is available, use it. If not, check alternates.

Find a free address in the list. Most desktop PC's have a COM1
and possibly a COM2 already on their system, which will be seen in
the list. You may have to start at COM3 or COM4 to start your
addressing of the ISA card you have. If these addresses are used
you may have to resort to the Frequently Unused Port Addresses
(found in Chapter 4, Table 3) of this manual. Write these open
addresses and IRQ's down for later reference.
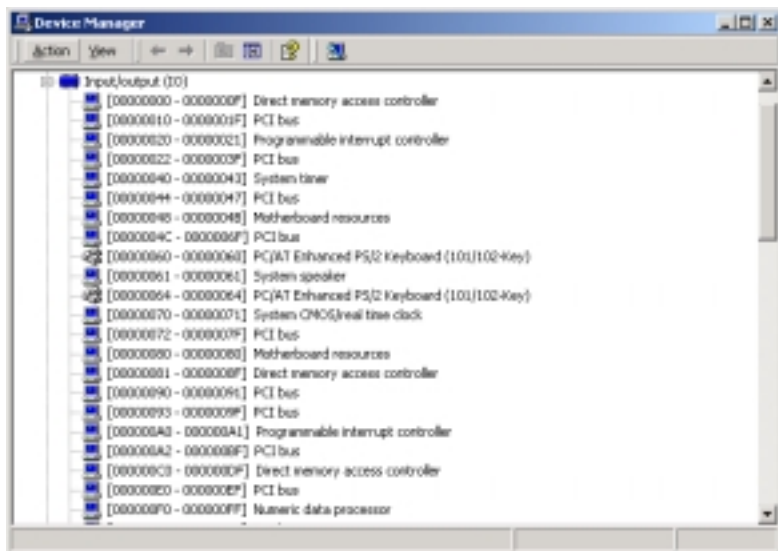
Double-click on Interrupt Request (IRQ). Here you will need to find an unused IRQ to set your B&B Electronics serial card to.
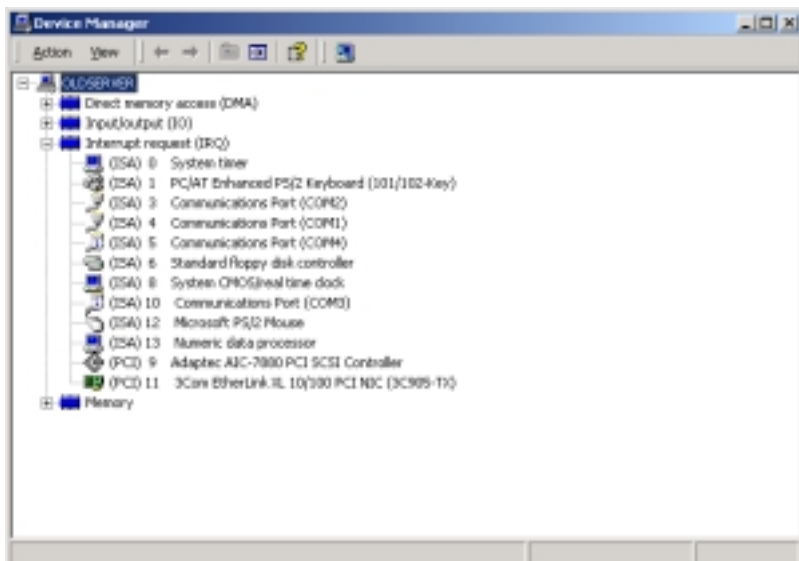
Adding Serial Port(s) in Windows 2000

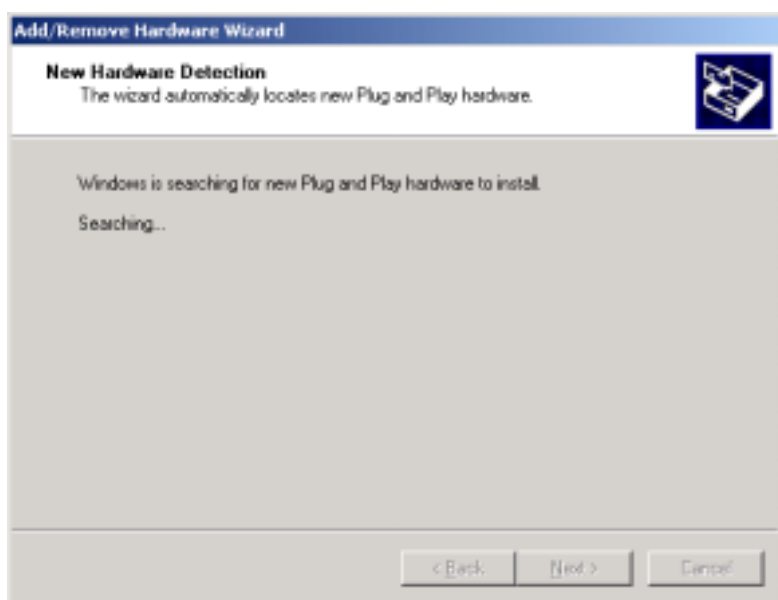Go to Start Menu / Settings / Control Panel.

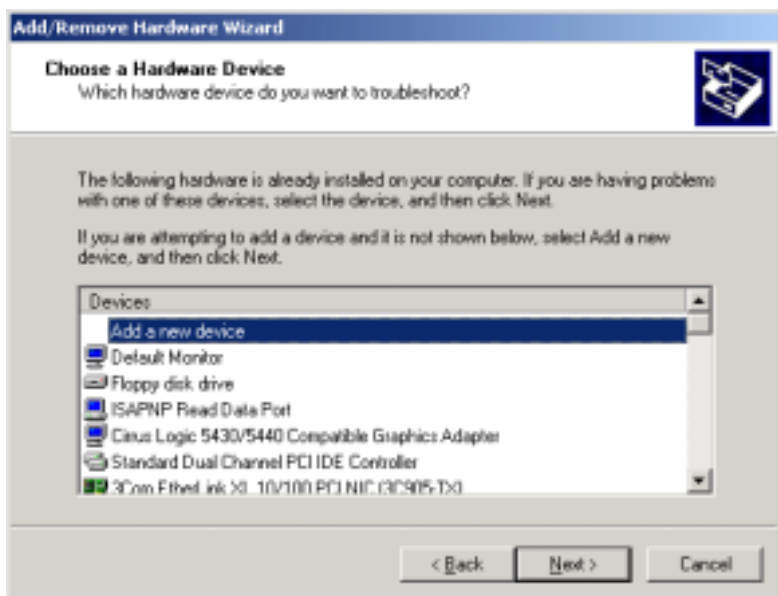Double-click on Add/Remove Hardware.
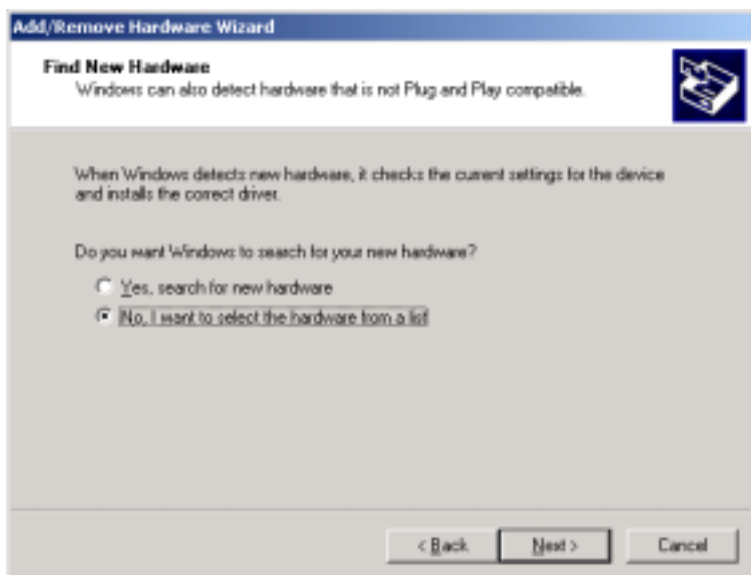
Click Next.

Click on Add/Troubleshoot a device.

Click Next.

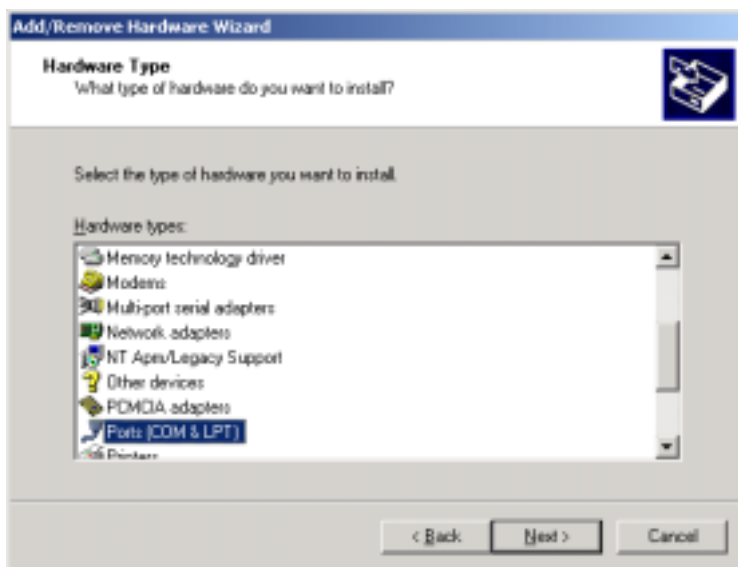The following screen will appear after a few seconds.

Add/Remove Hardware Wizard

Choose a Hardware Device
Which hardware device do you want to troubleshoot?

The following hardware is already installed on your computer. If you are having problems with one of these devices, select the device, and then click Next.

If you are attempting to add a device and it is not shown below, select Add a new device, and then click Next.

Devices

- Add a new device
- Default Monitor
- Floppy disk drive
- ISAPNP Read Data Port
- Cirrus Logic 5430/5440 Compatible Graphics Adapter
- Standard Dual Channel PCI IDE Controller
- 3Com EtherLink XL 10/100 PCI NIC (3C905-TX)

< Back   Next >   Cancel

Click Add a new device.

Click Next

Add/Remove Hardware Wizard

Find New Hardware
Windows can also detect hardware that is not Plug and Play compatible.

When Windows detects new hardware, it checks the current settings for the device and installs the correct driver.

Do you want Windows to search for your new hardware?

○ Yes, search for new hardware
● No, I want to select the hardware from a list
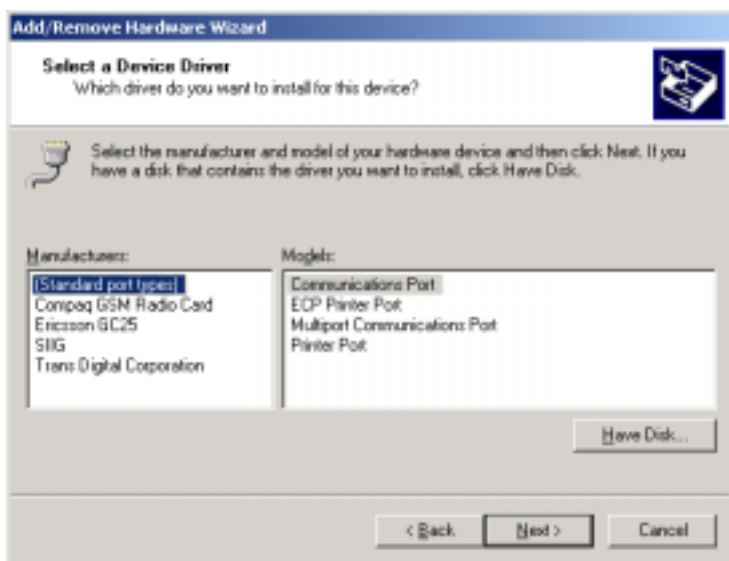
< Back   Next >   Cancel

Click No, I want to select the hardware from a list.
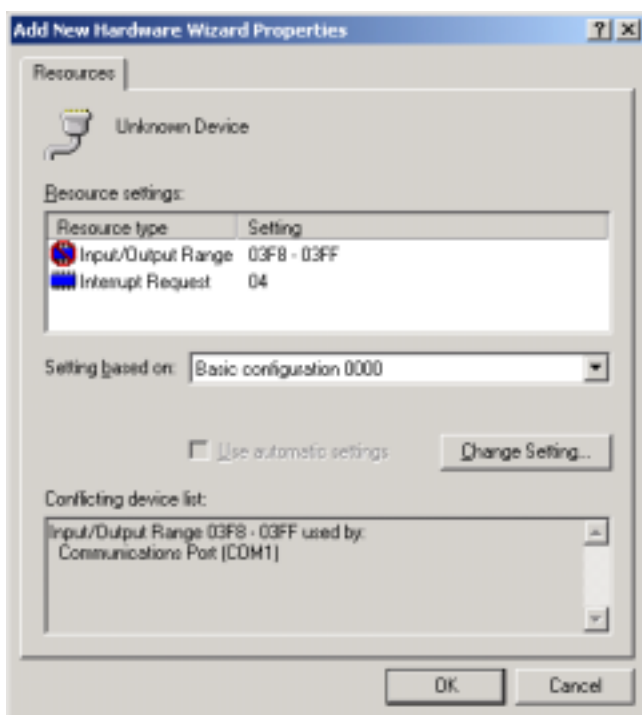

Click Ports (COM & LPT).

Click Next.

Select Standard port types and Communication Ports and Click Next. You will see the following screen, go ahead and Click OK.

Add/Remove Hardware Wizard

⚠ Windows could not detect the settings of the device. To use this device, you must enter its hardware settings. Consult the documentation that came with this device for information

[OK]

The Resources area will allow you to set the IRQ and address of your new ports.

Click on the down arrow to the middle right of the screen after "Setting based on":

Add New Hardware Wizard Properties

Resources

🔌 Unknown Device

Resource settings:

Resource type	Setting
Input/Output Range	03F8 - 03FF
Interrupt Request	04

Setting based on: Basic configuration 0000

☐ Use automatic settings   [Change Setting...]

Conflicting device list:

Input/Output Range 03F8 - 03FF used by:
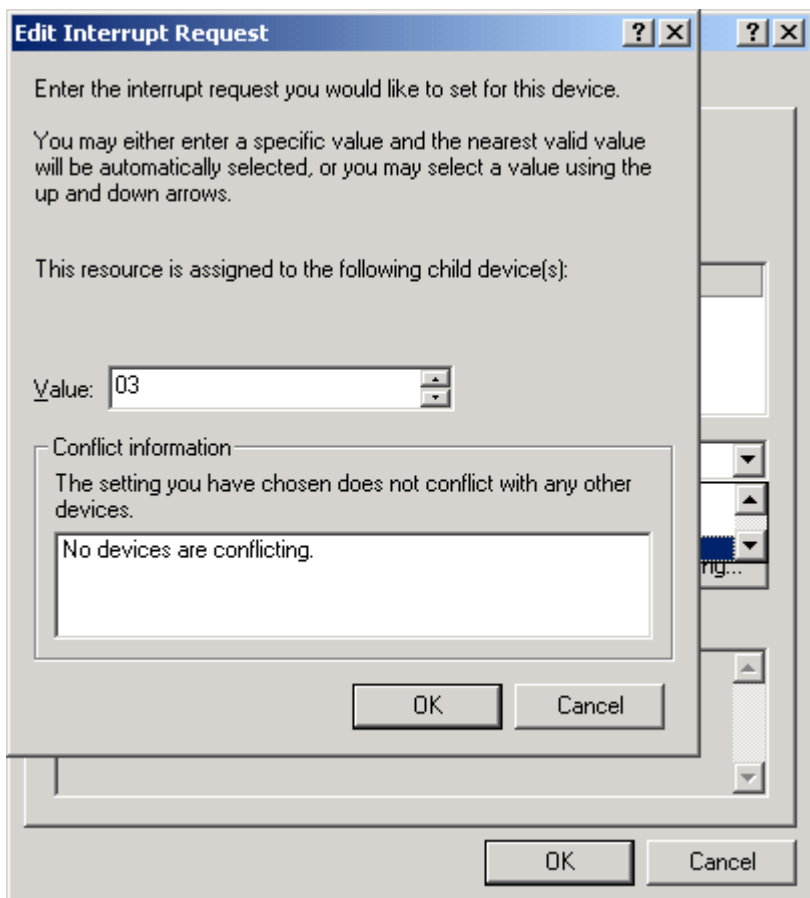Communications Port [COM1]

[OK]   [Cancel]

Click on the highest Basic configuration number in the list on the "Setting based on" category.

Double-click on the Input/Output Range to set the Address.

Double-click on the Interrupt Request to set the IRQ.
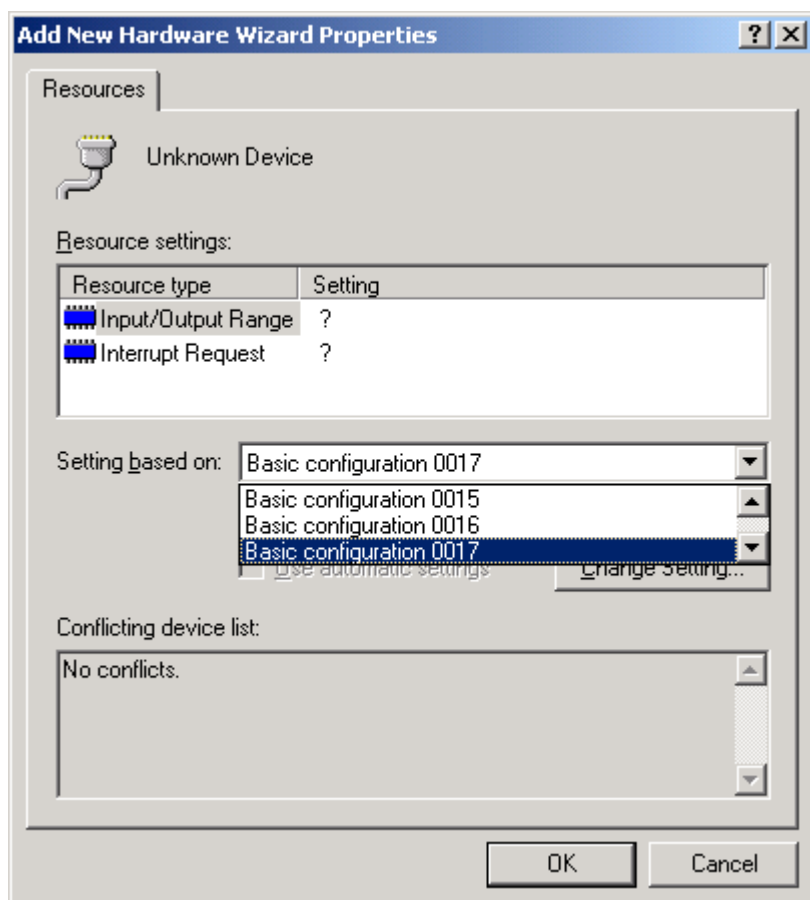
Select IRQ and Address that you want your port(s) configured at.

Edit Interrupt Request

Enter the interrupt request you would like to set for this device.

You may either enter a specific value and the nearest valid value will be automatically selected, or you may select a value using the up and down arrows.

This resource is assigned to the following child device(s):

Value: 03

Conflict information

The setting you have chosen does not conflict with any other devices.

No devices are conflicting.

OK   Cancel

OK   Cancel

At this point you can shut down the system and physically install your B&B Electronics Serial Card into an available ISA slot. Double check to make sure the addresses and IRQ's on the Serial Card are set to the correct settings.

Chapter 4: Address and IRQ Setting

Address Switch Setup

A Windows PC has I/O port addresses and memory addresses. Some devices use both types of addresses. I/O port addresses have a 64K address space. Devices may decode all 16 address bits or only some of the lower bits. Traditionally, serial cards have only decoded 10 bits of the address bus. Recently this has begun to cause address conflicts with full 16 bit decoded devices, most notably between video cards and COM 4. B&B has solved these conflicts by decoding all 16 bits of the ISA address bus. Address settings in our ISA bus serial cards is set by DIP switches (selecting bits 11-4) or jumpers.

> **CAUTION: Electrostatic Sensitive Device.**
> **Use ESD precautions for safe handling.**

B&B Electronics 3PXCC4A cards are factory configured for COM1 (IRQ4), COM2 (IRQ3), COM3 (IRQ5), and COM4 (IRQ7). If you plan on installing two of the four ports on the 3PXCC4A as standard COM1 and COM2, you may leave the address and IRQ set to the factory defaults for COM1 and COM2.

The 3PXCC4A cards use a 7-position DIP switch to program the binary I/O address of each port on the card. Figure 1 is a drawing of the printed circuit board that shows the locations of the setup switches and jumpers on the 3PXCC4A cards.

Figure 1. Silk Screen Plot of 3PXCC4A PCB
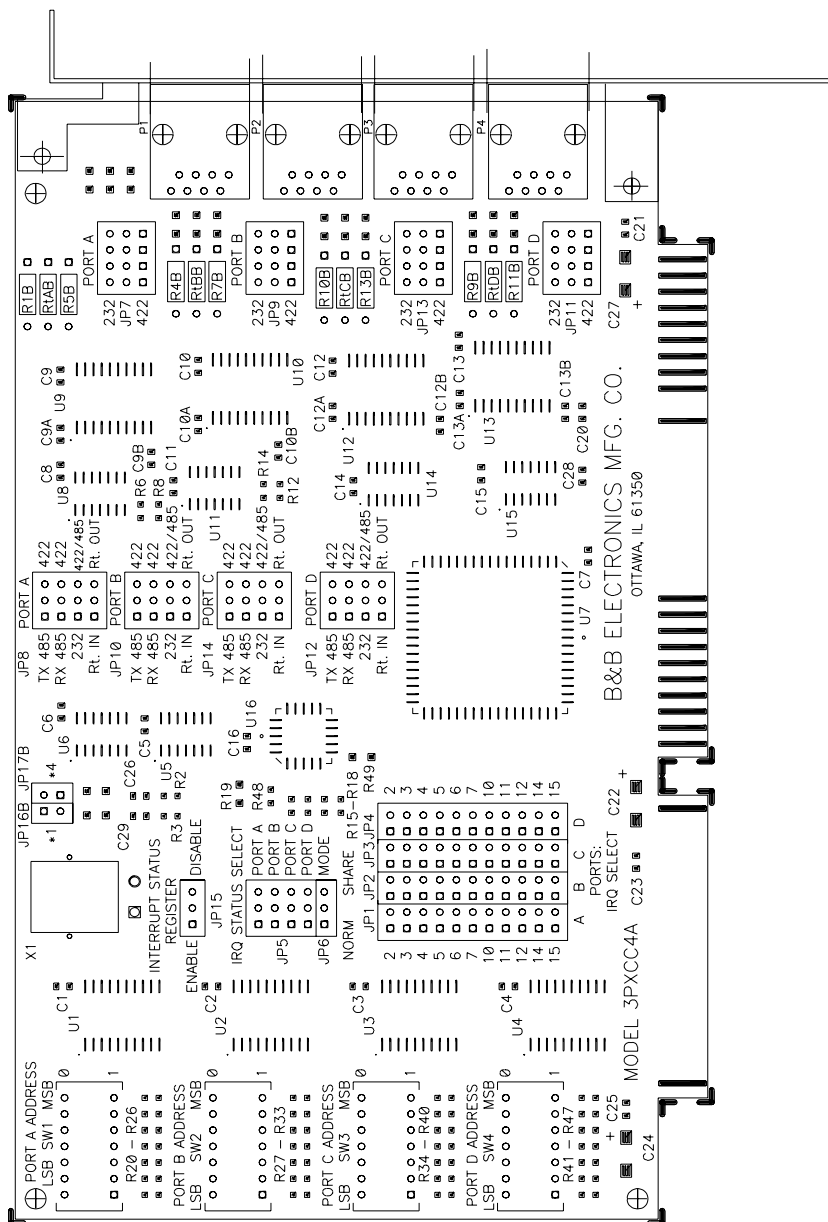
When setting the address (via the dipswitch) use the silkscreen on the printed circuit board. This silkscreen shows a "1" and a "0" to refer to the "on and "off" states that each switch is set to. Switch S1 configures port one (labeled J1) and, on two port cards, switch S2 configures port two (labeled J2). Least significant bit (LSB) and most significant bit (MSB) are labeled on the card. Table 1 shows the numerical weight and electrical connection of each switch position. Refer to Table 2 for COM port addresses. Table 3 shows frequently unused port addresses for applications when COM port addresses 1-4 are already used.

Table 1. Address Switches

Switch Position	7	6	5	4	3	2	1
Bus Connection	SA9	SA8	SA7	SA6	SA5	SA4	SA3
Decimal Weight	512	256	128	64	32	16	8
Hex Weight	200	100	80	40	20	10	8

To install the 3PXCC4A card as COM1, 2, 3, or 4, follow the switch settings shown in Table 2. To install at another address, follow the switch settings shown in Table 3.

Table 2. Standard Port Addresses

	Base Hex Address	Binary Equivalent	Switch Settings MSB LSB 7654321
COM1	3F8	1111111000	1111111
COM2	2F8	1011111000	1011111
COM3	3E8	1111101000	1111101
COM4	2E8	1011101000	1011101

Table 3. Frequently Unused Port Addresses

Base Hex Address	Binary Equivalent	Switch Settings MSB LSB 7654321	I/O Space Description
200	1000000000	1000000	game port
208	1000001000	1000001	game port
300	1100000000	1100000	prototype
308	1100001000	1100001	prototype
310	1100010000	1100010	prototype
318	1100011000	1100011	prototype
380	1110000000	1110000	SDLC
388	1110001000	1110001	SDLC
3A0	1110100000	1110100	bisync com
3A8	1110101000	1110101	bisync com

Interrupt Jumper Setup

The IRQ is a hardware Interrupt Request line in an ISA bus expansion slot on a PC or AT compatible computer. The 8 bit PC ISA slot has 8 interrupts, the 16 bit slot has another 7 since one of the first 8 is used to link in the remaining 8. The IRQ is used by devices to request immediate service by the main microprocessor. When the IRQ line is set, the microprocessor stops whatever it's doing, saves status, checks which line was set, then jumps to code to handle the interrupt. The processor then clears the interrupt and returns to what it was doing before. IRQ lines are set by the internal timer, keyboard, hard drive controller, PCI, USB controller, sound card, serial ports, printer and more.

The 3PXCC4A cards allow the use of interrupts (IRQ) 2, 3, 4, 5, 6, 7, 10, 11, 12, 14, and 15. Table 4 shows the standard serial port IRQ settings. Note: If two ports use the same IRQ setting, both ports cannot use the serial port at once. Only one port at a time may communicate.

Table 4. Standard IRQ Settings

COM1	IRQ4
COM2	IRQ3
COM3	IRQ4
COM4	IRQ3

Shared IRQ Mode

The 3PXCC4A card has the ability to share interrupts among its ports. Shared IRQ mode should only be used if your software supports this feature. If you are writing your own software, B&B Electronics' SimpCom V1.04 and later serial communications library supports this feature.

When sharing ports, use JP5 to set each of the ports to be used in shared mode to the SHARE position. JP6 must also be set to the SHARE position. Each of the ports set to SHARE will use the Port A IRQ. Therefore when sharing IRQs among two or more ports, Port A must always be one of the shared ports.

Chapter 5: Communication Jumper Settings

This chapter will cover all of the jumper settings to set your B&B Serial Card for the proper communications that you desire.

> **CAUTION: Electrostatic Sensitive Device.**
> **Use ESD precautions for safe handling.**

RS-232 Mode

To configure Port A for RS-232 mode, 5 jumpers must be checked. The following settings will configure PORT A as RS-232.

1. The four jumpers of JP7 - must be set to the "232" (upper) position.

2. The third jumper of JP8 must be set to the "232" (left) position.

The remaining jumpers of JP8 have no meaning in RS-232 mode and may be in either position.

RS-422 Mode

To configure Port A for RS-422 mode, 7 jumpers must be checked. The following settings configure PORT A as RS-422.

1. The four jumpers of JP7 must be set to the "422" (lower) position.

2. The top three jumpers of JP8 should be set to the 422 (right) position. The bottom jumper of JP8 switches the 120 Ω receiver termination resistor in or out. Typically this resistor should not be used. In some cases using high baud rates and very long cables, termination should be used.

Note that the EIA RS-422 Specification labels data lines with an "A" and "B" designator. Some RS-422 equipment uses a "+" and "-" designator. In almost all cases, the "A" line is the equivalent of the "-" line and the "B" line is the equivalent of the "+" line. More information on RS-422 communications can be found in B&B Electronics' free RS-422/RS-485 Application Note.

RS-485 Mode

To configure Port A for RS-485 mode, 7 jumpers must be checked. The following settings configure PORT 1 as RS-485.

1. The four jumpers of JP7 must be set to the "422" (lower) position.

2. The top two jumpers of JP8 should be set to the 485 (left) position. The third jumper of JP8 should be set to the 422/485 (right) position. The bottom jumper of JP8 switches the 120 Ω receiver termination resistor in or out. Typically this resistor should not be used. In some cases using high baud rates and very long cables, termination should be used.

RS-485 Operation

RS-485 mode requires that the driver be enabled and disabled as needed, allowing two or four-wire communications. To set up the 3PXCC4A Serial Card up for two wire mode you can simply jumper TD(A) to RD(A) (for your Data "-") and TD(B) to RD(B) (for your Data "+"). Use the Signal Ground for your return path as the thrid wire in this configuration. For four wire mode you simply use all four data lines and your signal ground for a return path. The 3PXCC4A card uses the RTS control line to put the driver in high-impedance or tri-state mode. With RTS control, software must set the RTS bit to a logic 1 to enable the driver and logic 0 to disable the driver.

The receiver can also be enabled and disabled, a useful feature in two-wire communications to prevent the transmitted data from "echoing back" on its own receiver. The RX 485 jumper for each port determines the reciever mode. If the jumpers are placed in the 485 position, the "echo" is turned off. This is achieved by disabling the reciever when the driver is enabled. Placing these jumpers in the 422 position will hold the reciever enabled at all times. More information on RS-485 communications can be found in B&B Electronics' free RS-422/RS-485 Application Note.

RS-422 and RS-485 Termination

A 120Ω termination resistor has been provided for the RS-422/485 receivers. To enable the termination provided, the termination jumper should be placed in the Rt IN position (left). If you do not need to use termination, place the jumper in the Rt OUT position (right). Termination should only be used when very long cable runs are used with high baud rates. For example, with most cables which are 4000 feet or shorter and have baud rates at 19.2K baud or lower, termination is not required. Note that if the termination is enabled (IN), the biasing of the RS-485 network is altered and the value of the bias resistors will likely need to be changed somewhere on the network. More information on termination and biasing can be found in B&B Electronics' free RS-422/RS-485 Application Note.

High Speed Mode

High data rates can be obtained with the 3PXCC4A cards by adjusting JP16B and JP17B. This multiplies the clock speed supplied to the UARTs by 4 times to 7.328MHz for all ports, allowing data rates up to 460.8K baud in RS-422 and RS-485 modes. Note that RS-232 does not support these extended baud rates.

To enable the X4 clock, simply move the shorting jumper from JP16B (*1) to JP17B (*4). This jumper is shipped from the factory in the standard clock (*1) position.

Note that serial software is not aware of the change in oscillator frequency. For example, in the ×4 position, setting the baud rate to 57.6K baud in software will result in a actual baud rate of 230.4K baud. It is important to note that increasing the baud rate may not increase actual throughput. In heavy multitasking cases or with a slow computer, the computer's inability to respond to interrupts quickly enough will cause large idle spaces between characters. Increasing the baud rate to this point will not increase actual throughput.

Chapter 6: Physical Hook-up and Troubleshooting

This chapter will cover 3PXCC4A pinout, communication cable data, and troubleshooting information.

Pinouts

RS-232 Pinouts

The 3PXCC4A Serial Cards are wired using RJ45 type connectors for each port. The following table shows the pinout for the RS-232 connections.

RJ45 Pin	RS-232 Signal	Direction	Std. DB9 Pinout	Std. DB25 Pinout
1	RTS	output	7	4
2	TD	output	3	2
3	CTS	input	8	5
4	RD	input	2	3
5	DTR	output	4	20
6	DSR	input	6	6
7	DCD	input	1	8
8	GND	----	5	7

Table 5. RS-232 Pinout Description

NOTE: RJ45 pin numbers are referenced from left to right when looking into the connector receptacle with the component side of the card facing upwards.

RS-422 Pinouts

RS-422 mode supports transmit and receive data signals. The pinouts of the RJ45 connector are given in Table 6. Figure 5 shows how to connect a typical RS-422/RS-485 full duplex communication link.

RJ45 Pin	RS-422 signal	Direction	MDB9 Pinout	MDB25 Pinout
1	TD(B)	output	7	4
2	TD(A)	output	3	2
3	RD(B)	input	8	5
4	RD(A)	input	2	3
5	NA	NA	4	20
6	NA	NA	6	6
7	NA	NA	1	8
8	GND	----	5	7

Table 6. RS-422/RS-485 Pinout Description

RS-485 Pinouts

RS-485 mode supports both full and half duplex communications (transmit and receive data signals). The pinouts of the DB-9 connector are given in Table 6 (if full duplex communication is used). Figure 5 shows how to connect a typical RS-422/RS-485 full duplex communication link. Figure 6 shows how to connect a typical RS-485 half duplex communication link.

3PXCC4A Serial Card

	RS-422 Four Wire Device
TD(B+) Pin 1	RD(+)
TD(A-) Pin 2	RD(-)
RD(B+) Pin 3	TD(+)
RD(A-) Pin 4	TD(-)
GND Pin 8	GND

Figure 5. RS-422/RS-485 (Four Wire) Pinout Description

3PXCC4A Serial Card

	RS-485 Two Wire Device
TD(A-) Pin 2	DATA (-)
TD(B+) Pin 1	DATA (+)
RD(A-) Pin 4	
RD(B+) Pin 3	
GND Pin 8	GND
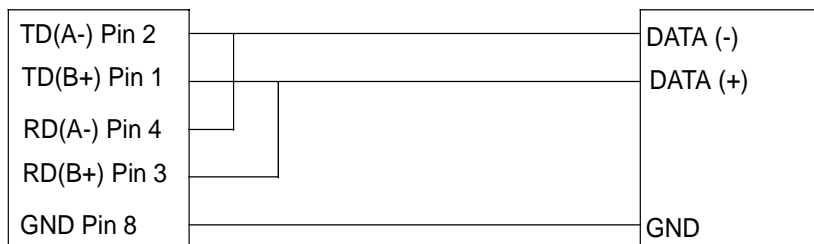
Figure 6. RS-485 (Two Wire) Pinout Description

Communication Cable Data

The 3PXCC4A Serial Card communicates using RS-232, RS-422, and RS-485 communications. The communication cable specifications are 24AWG (wire gauge) and 30pF/ft. (capacitance rating). Twisted pairs are ideal for the RS-422/RS-485 Cable in order to suppress noise on the data line. B&B Electronics can provide this communication cable for RS-232 or RS-422/RS-485 Applications. The Model ETC8195 is a cable style that can be used for RS-232 Applications, and Model ETC8506 can be used for RS-422/RS-485 Applications.

Troubleshooting

If you are unable to communicate with the card from your software:

1. Consult your software manual to make sure it supports the address and interrupt that you have configured.

2. Double check that the address and interrupt are properly set.

3. Try another software package for troubleshooting. Download SimpTerm (DOS Terminal Emulator) or Comtest (Windows Terminal Emulator) from B&B Electronics' web site. SimpTerm and Comtest are shareware Simple Terminal Emulators that can be used to vary the setup of any serial card. Both can be downloaded from the following site location.

http://www.bb-elec.com/support.asp

4. Troubleshooting with a Loopback Test

Load Simpterm or Comtest on the test PC. When loading Simpterm you must set up the port address and IRQ you have set on the B&B Electronics serial card.

Jumper TD to RD on the DB9 male connector located on the serial card. You may have to make a "loopback connector" in order to do this. This is done by jumping pin 2 and pin 3 of a DB9 female connector and plugging it into the DB9 male port on the serial card.

To test the RS-232 handshake lines you can also jumper RTS to CTS and DTR to DSR. When you raise the RTS line you should see CTS also go high. When you raise the DTR line you should see DSR also go high.

Send data from the Serial Port (B&B Electronics serial card) and see if the data is echoed back to the port. When a character is typed on the keyboard you must see a duplicate character after the first character to verify that the same character was received. Perform this test on all ports of your serial card to verify the ports can (or cannot) transmit and receive data.

5. Call B&B Electronics' Technical Support at the number/s shown below:

International/USA Office:
(815) 433-5100, 8a.m. - 5:00 p.m. weekdays (Central USA Time).

European Office:
+353 91-792444, 8a.m. – 4:30 p.m. weekdays (UK).

Appendix A: Hardware I/O Map

I/O Map of XT Class Machines

Hex Address	Address Function in XT Class Machines
000-00F	DMA controller (8237A)
020-021	interrupt controller (8259A)
040-043	timer (8253)
060-063	PPI(8255A)
080-083	DMA page register (74LS612)
0A0-0AF	NMI - non maskable interrupt
200-20F	game port joystick controller
210-217	expansion unit
2E8-2EF	COM4 serial port
2F8-2FF	COM2 serial port
300-31F	prototype card
320-32F	hard disk
378-37F	parallel print
380-38F	SDLC
3B0-3BF	MDA - monochrome adapter and printer
3D0-3D7	CGA - color graphics adapter
3E8-3EF	COM3 serial port
3F0-3F7	floppy diskette controller
3F8-3FF	COM1 serial port

I/O Map of AT Class Machines

Hex Address	Address Function in AT Class Machines
000-01F	DMA controller #1 (8237A-5)
020-03F	interrupt controller #1 (8259A)
040-05F	timer (8254)
060-06F	keyboard (8042)
070-07F	NMI - non maskable interrupt & CMOS RAM
080-09F	DMA page register (74LS612)
0A0-0BF	interrupt controller #2 (8259A)
0C0-0DF	DMA controller #2 (8237A)
0F0-0FF	80287 math coprocessor
1F0-1F8	hard disk
200-20F	game port joystick controller
258-25F	Intel Above Board
278-27F	parallel printer port 2
2E8-2EF	COM4 serial port
2F8-2FF	COM2 serial port
300-31F	prototype card
378-37F	parallel printer 1
380-38F	SDLC or bisync com 2
3A0-3AF	bisync com 1
3B0-3BF	MDA - monochrome adapter
3BC-3BE	parallel printer on monochrome adapter
3C0-3CF	EGA - reserved
3D0-3D7	CGA - color graphics adapter
3E8-3EF	COM 3 serial port
3F0-3F7	floppy diskette controller
3F8-3FF	COM1 serial port

Any eight-byte space not used by one of the devices listed in the table and not used by any other equipment in your system may be used for the serial port.

Appendix B: Declaration of Conformity Statement

DECLARATION OF CONFORMITY

Manufacturer's Name:	B&B Electronics Manufacturing Company
Manufacturer's Address:	P.O. Box 1040 707 Dayton Road Ottawa, IL 61350 USA
Model Numbers:	3PXCC4A1A, 3PXCC4A1B, 3PXCC4A2A, 3PXCC4A2B
Description:	RS-232 Serial Card
Type:	Light industrial ITE equipment
Application of Council Directive:	89/336/EEC
Standards:	EN 50082-1:1992 IEC 801 (-2, -3, -4) EN 61000 (-4-2, -4-3, -4-4, -4-6) EN 50082-1:1998

CE

Michael J. Fahrion, Director of Engineering